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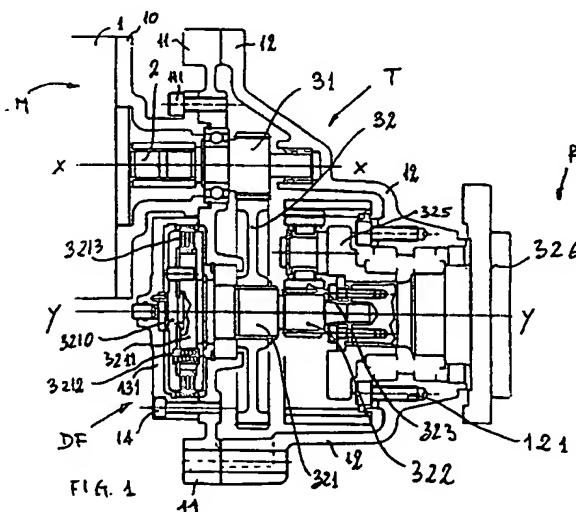
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(54) Transmission apparatus with integrated braking device

(57) Transmission apparatus (T) with integrated braking device (DF), particularly of the type involving a reduction gear transmission system (T) which:

- on one side is mounted on the live axle of a drive motor (M) and
- on the other one the respective driving means such as for instance a wheel or another device to be rotated (R) is mounted, characterised in that the transmission system of said transmission (T), is arranged according to a "Z"-like direct transmission line by means of:
  - a driving pinion (31) keyed to the live axle (2) of said motor (M) on the live axle (X-X);
  - which engages with a bigger wheel (32) which drives the motion to a driven axle (321) on an adjacent parallel axle (y-y) which:
  - on one side is axially connected, by epicyclic reduction (323-324-325) to a keying means (326) to said device to be rotated (R), and
  - on the other one to a boxed coaxial braking device (DF), with an opening and external access axial door (131).



## Description

[0001] The present invention has for object a transmission apparatus with integrated braking device.

[0002] The present transmission system finds particular even if not exclusive application in the motion transmission to the drive wheels of vehicles being directly driven by an electric or hydraulic motor.

Prior art.

[0003] In prior art it is known that in the motion transmission to the drive wheels of vehicles, particularly industrial ones, such as for instance tractors, lift trucks, operating machines, electric or hydraulic independent motors are used, one for each drive wheel, in which each motor is connected to the wheel axle by a transmission system with incorporated reduction gear and brake.

[0004] In such a case the use of separate brakes generally integrated to the wheels is avoided, by instead integrating them in the transmission reduction gear system.

[0005] In this case there is the advantage of a considerable reduction of costs and a simplification of the whole driving and braking system. Prior art drawbacks

[0006] The prior art drawbacks substantially are:

- difficulty of access to the braking system, both for adjustment and maintenance, being it generally incorporated within the transmission reduction gear, so that disassembling the whole reduction gear transmission system is necessary for having access to the braking device, which, generally having oil lubricated disks has anyway a need for maintenance and intervention.

[0007] Further an oil bath braking system as above mentioned has the drawback of needing the use of a type of oil which may be a compromise between the two uses.

[0008] The disk wears deteriorate the reduction gear oil endangering the bearings and gears life.

[0009] It is instead known that being possible to use a separate type of oil and with specific characteristics for the two functions (gear lubrication and brake lubrication) better performances of the apparatus may be obtained.

[0010] Purpose of the present invention is that of obviating the above mentioned drawbacks and:

- making the braking system independent of the transmission system, though without renouncing the above mentioned advantages, thus keeping the braking device always integrated in said transmission.

## Essence of the invention

[0011] The problem is solved as claimed by a transmission apparatus with integrated braking device, particularly of the type involving a reduction gear transmission system which:

- on one side is mounted on the live axle of a drive motor and
- on the other one the respective driving means such as for instance a wheel or another device to be rotated is mounted, characterised in that the transmission system of said transmission, is arranged according to a "Z"-like direct transmission line by means of:
  - a driving pinion (31) keyed to the live axle of said motor on the live axle (X-X);
  - which engages with a bigger wheel (32) which drives the motion to a driven axle on an adjacent parallel axle (Y-Y), which:
    - on one side is axially connected, by epicyclic reduction to a keying means to said device to be rotated, and
    - on the other one to a boxed coaxial braking device (DF), with an opening axial door and external access.

## Advantages of the new solution

- [0012] Thus the advantage of having a more effective and reliable device is obtained.

## Description of two types of invention embodiment

- [0013] These and other advantages will appear from the following description of a preferred solution, with the aid of the enclosed drawings, whose execution details are not to be considered as limitative but only as examples.

Figure 1 is an axial section schematic view of the transmission passing through the two axles according to the present invention with use of the active braking system.

Figure 2 is an axial section schematic view of the transmission passing through the two axles according to the present invention with use of the active braking system.

- [0014] According to the figures:

- with "M" the motor, which may be electrical or hydraulic or another suitable one is indicated;
- with "T" the transmission object of the present invention;
- with "DF" the braking device arranged according to the present invention and always integrated with

said "T" transmission;

- with "R" the driven, that is made rotate, means such as for instance a drive wheel of a vehicle (not shown), of known art.

[0015] More in particular, the motor "M" has a cover (10) which is keyed on a side to its motor box (1), and on the other side, by means of screws (111), to a counter-box (11) of said transmission apparatus "T", which in its turn is fixed to the body (12) which contains the transmission reduction gear system.

[0016] The body (12) thus includes said "Z"-like transmission system on two axles "X-X; Y-Y" and involves on a side the axial exit "Y-Y" for the keying (326) to a wheel "R" and on the other side clamps said counter-box (11) which houses said braking device (DF) in its turn closed by the axial cover (131) and sealingly locked by screws (14). Thus an easy access to the braking device (DF) is allowed and an oil different from the one contained in the box (12) of the "T" transmission system may be conveyed to the same, being these two chambers hermetically separated.

[0017] Further the thus conceived braking system, being in a separate chamber (DF) may be applied to the same "T" transmission with active and passive function according to the specific applications, for instance the passive system (Fig. 2)

- is always braked in case of oil pressure lack on the circuit, being the oil pressure on the respective flange (3250) opposing said braking spring means (3251) - See Fig. 3.

[0018] The active system (Fig. 1)

- is always free in case of oil pressure lack or mechanical functioning, the action operating by means of respective springs;
- is always braked in presence of oil pressure on circuit, the flange (3210) being in contrast with the springs (3212) action.

[0019] Advantageously said braking means (DF) are coaxial (Y-Y) with the exit and keying (326) driven axle to said wheel "R".

[0020] Advantageously the motion transmission is obtained by keying to the motor shaft (2), by a pinion (31) which operates a toothed wheel (32) keyed to the driven shaft (321) of said wheel axle (Y-Y), which:

- on a side is keyed for being braked to said braking device (DF), and
- on the other side, by means of a pinion (322), transmits the motion to a satellite wheel (323), which engages with a crown (324), which makes a satellite-holder (325) rotate in reduction, always keyed on the same axle (Y-Y) which brings an external flange (326) for the keying to said driven wheel (R).

The execution details may be anyway changed.

## Claims

1. Transmission apparatus (T) with integrated braking device (DF), particularly of the type involving a reduction gear transmission system (T) which:
  - on one side is mounted on the live axle of a drive motor (M) and
  - on the other one the respective driving means such as for instance a wheel or another device to be rotated (R) is mounted, characterised in that the transmission system of said transmission (T), is arranged according to a "Z"-like direct transmission line by means of:
    - a driving pinion (31) keyed to the live axle (2) of said motor (M) on the live axle (X-X);
    - which engages with a bigger wheel (32) which drives the motion to a driven axle (321) on a adjacent parallel axle (y-y) which:
      - on one side is axially connected, by epicyclic reduction (323-324-325) to a keying means (326) to said device to be rotated (R), and
      - on the other one to an independent and water-tight boxed coaxial braking device (DF), with an opening and external access axial door (131).
2. An apparatus, according to claim 1, characterised in that said braking device (DF) is actioned by braking spring means (3212) against a disk pack (3213) supported by a central body (3211), being always free in lack of oil pressure or mechanical actioning being provided with spring means (3212) opposing a flange which clamps the braking pack (3210) freeing the respective brake disks (3213).
3. An apparatus, according to claim 1, characterised in that said device (DF) is actioned by braking spring means (3251) against a disk pack (3213) supported by a central body (3211), being:
  - always braked in lack of oil pressure, operating said spring means;
  - is always free in presence of oil pressure on the circuit, being the oil pressure on the respective flange which clamps the braking disks (3250) opposing respective braking spring means (3251);
4. An apparatus, according to claim 1, characterised in that said braking means (DF) are coaxial (Y-Y) with the exit and keying (326) driven axle to said wheel "R".
5. An apparatus, according to claim 1, characterised in that said "Z"-like motion transmission is obtained by keying to the motor shaft (2), by a pinion (31)

which operates a toothed wheel (32) keyed to the driven shaft (321) of said wheel axle (Y-Y), which:

- on a side is keyed for being braked to said braking device (DF), and 5
- on the other side, by means of a pinion (322), transmits the motion to a satellite wheel (323), which makes a satellite-holder (325) rotate in reduction, always keyed on the same axle (Y-Y) 10 which brings an external flange (326) for the keying to said driven wheel (R).

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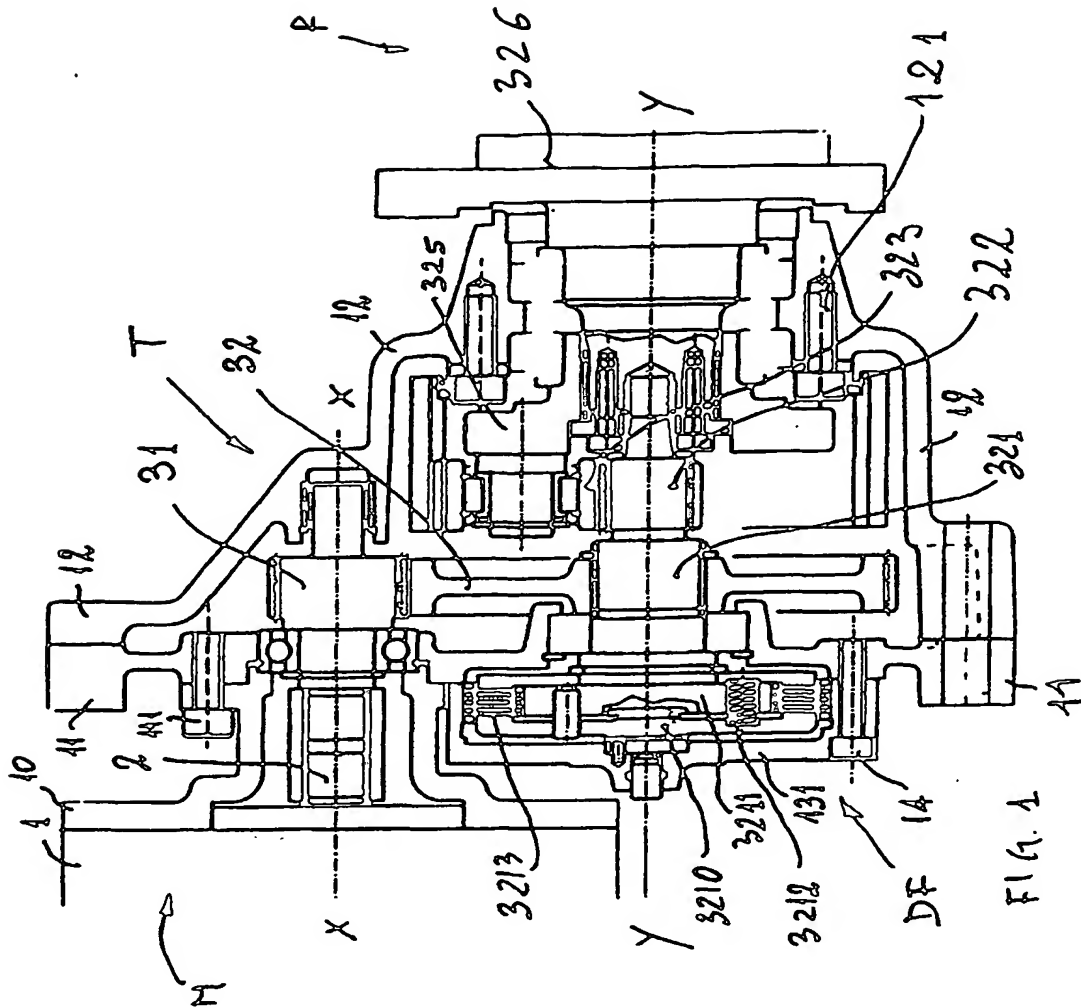
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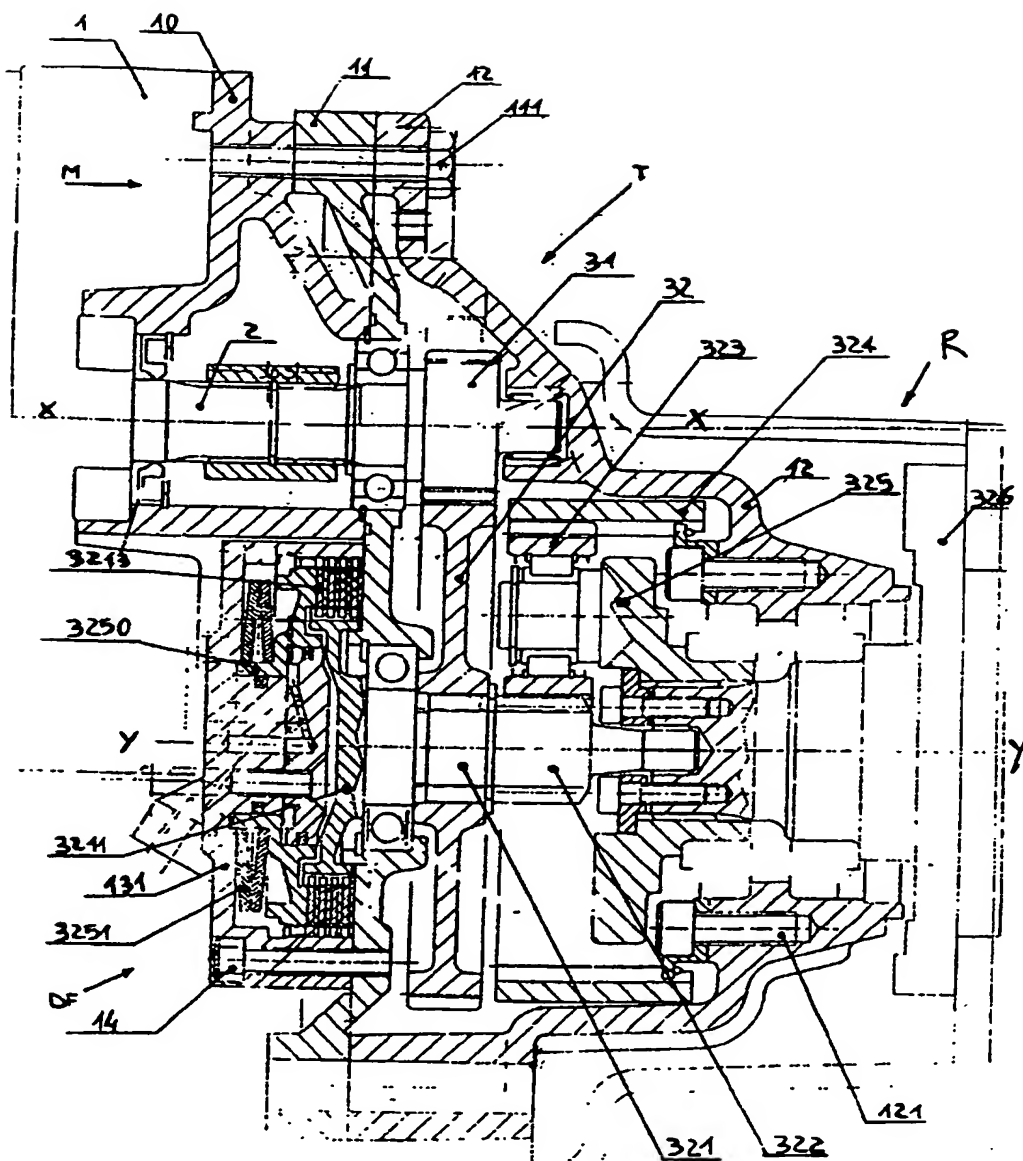
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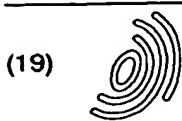
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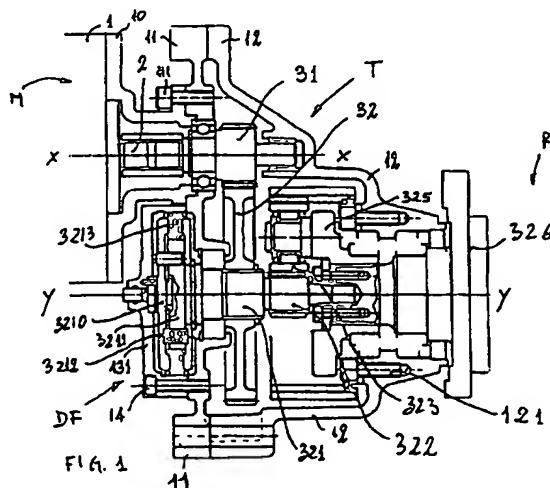
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  - a driving pinion (31) keyed to the live axle (2) of said motor (M) on the live axle (X-X);
  - which engages with a bigger wheel (32) which drives the motion to a driven axle (321) on an adjacent parallel axle (y-y) which:
  - on one side is axially connected, by epicyclic reduction (323-324-325) to a keying means (326) to said device to be rotated (R), and
  - on the other one to a boxed coaxial braking device (DF), with an opening and external access axial door (131).





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## EUROPEAN SEARCH REPORT

Application Number  
EP 98 12 1712

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	FR 1 520 303 A (TRACTOR RESEARCH LTD) 5 August 1968 (1968-08-05) * the whole document *	1	B60K17/04 B60K7/00
A	US 3 536 230 A (WILLIAMS JOHN E) 27 October 1970 (1970-10-27) * abstract; figure 1 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B60K B60T F16D
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>15 June 2000</b>	Examiner <b>Wagner, H</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)



**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 98 12 1712

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The members are as contained in the European Patent Office EDP file on  
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15-06-2000

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